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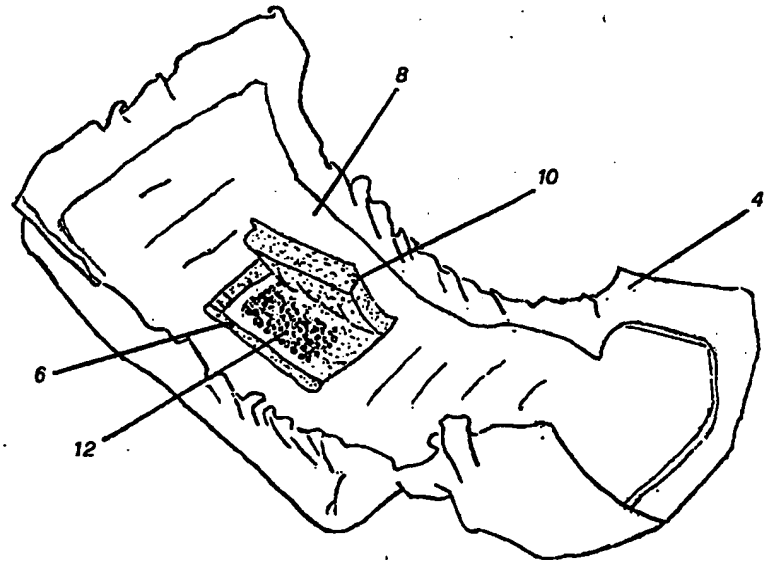
(54) Title: NAPKIN WITH BUFFER SUBSTANCE



(57) Abstract

A napkin for children and adults and/or a sanitary towel for ladies is disclosed to which a buffer substance is added to keep a physiologically correct pH on the surface of the skin for preventing the skin irritations due to the contact with faeces and urine. The buffer substances are placed within the fluff and/or on the surface of the napkin contacting the genitals of the user. Several buffer substances both of the organic and inorganic types as well as disinfectant buffer salts are indicated.

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DESCRIPTION

Napkin with buffer substance

Technical field

The present invention relates to the field of the napkins for children and adults and/or sanitary towels for ladies, and more in particular concerns napkins and sanitary towels to which a buffer substance is added to keep the surface of the skin at a pH which is physiologically correct, thus preventing the skin irritations.

Background art

The merits of the napkin as sanitary means are known for some time. It offers to the child the draining of urine and faeces without ruining his clothes and saves the parents the hard work of washing them continuously.

Furthermore, as the napkins are disposable items which cannot then be recycled, they are free from any infection danger unlike the old triangular clothes which were not always duly disinfected.

However, besides such undoubted advantages napkins and sanitary towels also have a serious drawback. In fact, as the faeces are absorbed, the change of the napkin by the parents is delayed, thus increasing the medium time of contact between faeces and skin. Such constant and prolonged contact with faeces characterized by a pH which is very different from that of the skin of the child causes the maceration of the skin with reddening and ulceration of buttocks and genitals of the baby.

Disclosure of the invention

The invention seeks to obviate such drawback by providing a napkin capable of adjusting a correct pH, i.e. a pH corresponding to the physiological pH of the skin.

The inventive step at the base of the invention is that of adding to the napkins for children and adults as well as to the sanitary towels for ladies buffer substances both of the organic and inorganic types.

The invention is based on experimental data: the urine of the first days has a clearly acid pH (pH 5,5) while the pH increases to 7 in the adult. Such data refers to the just excreted urine.

Ammonia is present in a considerable concentration both in the adult and in the child and represents about 5% of the nitrogen in the just excreted urine. However, it increases after a short time from the miction due to the oxygen of the air which oxidizes urea to CO_2 and NH_3. It should not even be excluded that the bacteria have a part in the increase of ammonia since they are in an ideal environment: warm, wet and rich in nitrogenous excretions. Upon changing napkin the odour of ammonia can be usually smelled.

Under these conditions the napkins irritates the skin of the baby since the urine is highly alkaline.

It is known that the addition of buffer substances capable of neutralizing the acid and basic influences stabilizes the pH.

Generally the buffer substances are salts of polybasic acids or mixtures of weak acids (or bases) and their salts formed of strong bases (or acids). The system is easy: the

concentration of hydrogen ions of a solution, i.e. the pH, can be changed by adding an acid or a base. If a buffer is added to the solution, the change (ΔpH) caused by adding an acid or a base is reduced.

The most common buffers which can be used are mentioned in the following list excluding for obvious reasons the buffer substances having non-physiological pH and those which would be used in a technically wrong way (for example liquid, volatile or toxic buffers):

Citric acid - sodium citrate buffer;

Monopotassic phosphate - bisodic phosphate buffer;

Tartaric acid - tartrate salt buffer;

Sorbic acid - sorbate salt buffer;

Benzoic acid - benzoate salt buffer.

Of course, acids or salts alone can also be used when the action thereof is physiologically compatible: for example, boric acid which is very weak. Furthermore, amphoteric substances such as metal hydroxides and/or aminoacids such as glycine.

Disinfectant buffer salts such as sorbates and benzoates alone or in addition to other buffers can also be used.

The "buffer capability" is given by the buffer value $T = 1/V \times dN/dpH$, where V is the volume of the solution in litres and N is the added amount of acid or base in equivalents.

In the present case it is rather difficult to exactly calculate the buffer capability of the solution formed inside the napkin since the amount of solvent, i.e. the urine excreted by the baby, cannot be known even if the amount of salts is known. It should be appreciated that

the number of mictions in a baby aged 12 months can be 2-6 to 15-20 per day. Such are the mean values as a lot of babies urinate 30-40 times a day. Generally in the second year of life the number of the mictions drops to 8-10 per day. The amount of urine after the first 2 or 3 days is more copious than in the adult in relation to the body surface and the weight. In spite of the variability of such values it is however possible to give an example for approximately calculating the buffer solution, thus providing significant information about the necessary buffer substances.

EXAMPLE 1

We assume that a baby aged two produces 600 cc of urine per day and that three napkin changes a day are provided (failing estimate). 600/3=200 cc of urine per napkin are provided.

In the hypothesis of using a phosphate buffer it is possible to calculate how many grams of sodium dihydrogenphosphate and sodium monohydrogenphosphate should be dissolved in 200 cc of solution to obtain a solution having a pH chosen at random, for example 6,40, and a buffer value also chosen at random, for example 0,05.

Concentration = C = $0,05/23 \times (1+10^{pKa-pH})^2 / 10^{pKa-pH} =$

$= 0,0217 \times (1+10^{0,81})^2 / 10^{0,81} = 0,0217 \times 55,6/6,456 =$

= 0,186 moles/l.

Additionally, indicating at T the buffer value and at W the fraction present as acid, $T = 2,3 \times C \times W \times (1-W)$. After calculation:

$W = 10^{pKa-pH} / 1 + 10^{pKa-pH}$,

i.e. in the present case:

$W = 10^{0,81} / 1 + 10^{0,81} = 6,456 / 7,456 = 0,86.$

Therefore:

C(acid) = $H_2PO_4^-$ = W x C = 0,86 x 0,186 = 0,16 moles/l of acid

C(base) = HPO_4^{2-} = (1-W) x C = 0,14 x 0,186 = 0,0026 moles/l of base.

Finally, as the molar weights of NaH_2PO_4 and Na_2HPO_4 are 120 g/mole and 142 g/mole, respectively:

0,16 x 120 = 19,2(g/l) x 0,2 = 3,84 g of NaH_2PO_4

0,026 x 142 = 3,69 (g/l) x 0,2 = 0,738 g of Na_2HPO_4,

i.e. 3,84 + 0,738 = 4,578 g of powdered buffer phosphate has to be introduced into a napkin.

In the sole accompanying drawing there is shown by way of a non-limitative example a preferred embodiment of the napkin according to the invention.

A napkin for babies is shown in a top perspective view. Such napkin generally indicated at 4 is provided with a window 6 in front of the genital area 8, i.e. the area contacting the genitals of the child, by scoring and raising the fluff 10. A buffer powder 12 is distributed in the fluff 10. In such embodiment the choice is fallen on a buffer powder consisting of citric acid-sodium citrate.

The effectiveness of the invention has been proven directly in laboratory, after the napkin is closed, by depositing at the buffer zone of the napkin a liquid coat of a 1% phenolphthalein solution.

A 0,6% ammonia solution is poured to that zone. Initially a colour change to red of the phenolphthalein is provided. After 5 minutes the red colour disappears due to the

buffer stabilizing the pH to the desired level, namely just acid.

If the problem of the urine is effectively solved by a depth buffer placed within the fluff as described above, the problem of the faeces is conversely solved by placing a buffer at the surface, i.e. a buffer placed directly on the surface of the napkin so as to keep constant the pH of the skin before the excretion of the faeces. In this case, the buffer substance can preferably be chosen among creamy or powdered substances allowing a buffer coat to be laid off on the surface of the napkin contacting the skin of the baby.

Claims

1. A napkin and/or sanitary towel for children and adults characterized in that there are incorporated buffer substances such as to keep the pH of the surface of the skin physiologically correct.

2. The napkin and/or sanitary towel for children and adults of the preceding claim characterized in that said buffer substances are placed within the fluff and/or on the surface of the napkin contacting the genitals of the user.

3. The napkin and/or sanitary towel for children and adults of the preceding claims characterized in that said buffer substances are salts of polybasic acids or mixtures of weak acids (or bases) with their salts formed of strong bases (or acids) both of the organic and inorganic type.

4. The napkin and/or sanitary towel for children and adults of the preceding claims characterized in that said buffer substances are in form of granules.

5. The napkin and/or sanitary towel for children and adults of the preceding claims characterized in that said buffer substances are in creamy or emulsified form.

6. The napkin and/or sanitary towel for children and adults of the preceding claims characterized in that a buffer powder consisting of citric acid-sodium citrate is

used as buffer substance.

7. The napkin and/or sanitary towel for children and adults of claims 1 to 5 characterized in that a buffer formed of monopotassic phosphate-bisodic phosphate is used as buffer substance.

8. The napkin and/or sanitary towel for children and adults of claims 1 to 5 characterized in that a buffer formed of tartaric acid-tartrate salt is used as buffer substance.

9. The napkin and/or sanitary towel for children and adults of claims 1 to 5 characterized in that buffer salts having disinfectant action such as sorbates and benzoates alone or in addition to other buffers are used.

10. The napkin and/or sanitary towel for children and adults of claims 1 and 2 characterized in that an acid and/or an extremely weak salt is used as buffer substance.

11. The napkin and/or sanitary towel for children and adults of claims 1 and 2 characterized in that an amphoteric substance is used as buffer substance.

12. The napkin and/or sanitary towel for children and adults of claims 1 and 2 characterized in that an aminoacid is used as buffer substance.

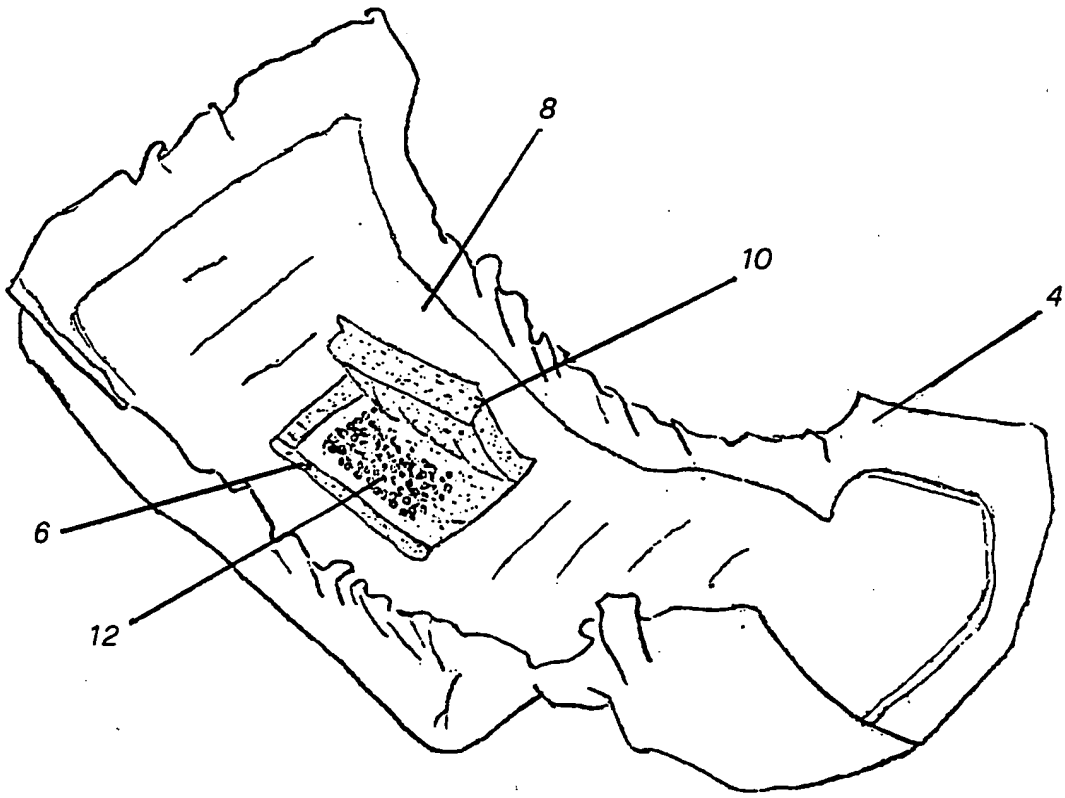

fig.1

INTERNATIONAL SEARCH REPORT

Interna al Application No
PCT/IT 94/00003

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L15/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP,A,0 564 307 (S. LEVI) 6 October 1993 see page 4, line 13 - line 31 see claims; examples	1-6,10 9,11,12
Y	DE,A,41 36 540 (AMERICAN ISRAELI PAPER MILLS LTD) 14 May 1992 see column 2, line 15 - line 40; claim 6	9
Y	GB,A,1 517 043 (PERSONAL PRODUCTS CO.) 5 July 1978 see claims	11,12
X	GB,A,2 107 192 (UNIVERSITY OF DELAWARE) 27 April 1983 see page 1, line 116 - line 120; claim 6	9

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
17 August 1994	26.08.94

Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB,A,727 631 (AKTIEBOLAGET WALLCO) 6 April 1955 see claims; examples	1-5,8
X	EP,A,0 130 356 (HENKEL KOMMANDITGESELLSCHAFT AUF AKTIEN) 9 January 1985 see claims	6
X	BE,A,570 673 (M. KROLL) 15 September 1958 see claims	7

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